LLNL Environmental Restoration Division Standard Operating Procedure	TITLE: SIMCO Drill Rig Operation
APPROVAL Date _____ _____ **Livermore Site Deputy Program Leader**	**PREPARER:** V. Dibley **REVIEWERS:** R. Bainer, T. Carlsen, J. Gardner*, J. Greci, and S. Nelson*
APPROVAL Date _____ _____ **Division Leader** **CONCURRENCE** Date _____ _____ **QA Implementation Coordinator**	**PROCEDURE NUMBER:** ERD SOP-1.13 **REVISION:** 2 **EFFECTIVE DATE:** December 1, 1995 **Page 1 of 19**

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1.0 PURPOSE

This Procedure provides operational guidelines and safety requirements for the Southern Iowa Manufacturing Company (SIMCO) drill rig operation. The procedure augments the manufacturer's documentation, *SIMCO Operator's Manual and Parts List*, which contains minimal precautions for safely operating the drill rig. The use of the SIMCO drill rig involves many potentially hazardous and dangerous operations associated with the use of heavy drilling machinery, including possible exposure to hazardous and radioactive wastes. This procedure describes the basic safety precautions and special safety considerations that must be followed when operating the drill rig.

2.0 APPLICABILITY

This procedure applies to the operation of the SIMCO drill rig (Model #2800, Serial No. 830986, Lot 133) and trailer (Model #3800, Serial No. 831001, Lot 63) at Site 300 and the Livermore Site.

3.0 REFERENCES

3.1 Code of Federal Regulations, Title 29, Part 1910, "Occupational Safety and Health Administration, Labor", Section 95, "Occupational Noise Exposure."

3.2 LLNL (1990), *Health and Safety Manual,* M-010, Lawrence Livermore National Laboratory, Livermore, CA.

3.3 LLNL Operations and Regulatory Affairs Division, WasteWater and Tank Systems (WATS) Group Procedure no. 208, *SIMCO Drill Rig Operation Procedure*, Rev. 0.

3.4 *Operators Manual and Parts List for Model 2800 HS*, Southern Iowa Manufacturing Company (SIMCO) Drilling Products Division, Box 448, Osceola, Iowa.

3.5 *Soil Sampling*, Operations and Regulatory Affairs Division, WATS Procedure No. 204, Lawrence Livermore National Laboratory, Livermore, CA.

3.6 *Underground Utility Location*, Operations and Regulatory Affairs Division, WATS Procedure No. 209, Lawrence Livermore National Laboratory, Livermore, CA.

4.0 DEFINITIONS

4.1 Blow Count

The number of times the hammer is dropped to drive the split-tube sampler into the soil in order to retrieve a soil sample for analysis.

4.2 Cathead Winch

The open drum-type powered winch located near the base and to the right of the drill rig mast. Used mainly for raising the hammer to drive the split-tube sampler into the soil.

4.3 Drill String

The assemblage of drill bit, auger sections, solid drill shaft (when used with the hollow-core auger), and fittings used to bore a hole in the soil when attached to the drill rig.

4.4 Hollow-Stem Auger

Hollow drill-shaft auger sections are used to drill to the desired depth by attaching the necessary number of auger sections. The hollow shaft of the auger sections provides a pathway to collect soil samples using a split-tube sampler lowered through the center of the auger. This requires the use of drill rod sections placed through the hollow core to prevent soil from accumulating inside the auger sections during drilling.

4.5 Mast

The steel structure that supports the drill string and drive motor. When the mast is fully extended it measures approximately 20 ft from the ground to the top.

4.6 Southern Iowa Manufacturing Company (SIMCO) Drill Rig

The SIMCO drill rig is a hydraulically-operated machine used for shallow drilling and soil sampling.

4.7 Solid-Flight Auger

Solid drill-shaft auger sections are used to drill to the desired depth by attaching auger sections together. These are used when soil samples will not be collected.

4.8 Split-tube Sampler

A soil sampling device used to collect soil samples driven down the center of the hollow-core auger into the soil being sampled. The split-tube sampler is then retrieved and the soil sample is removed and sent to a laboratory for potential contaminant analysis.

5.0 RESPONSIBILITIES

Note: The following responsibilities (Sections 5.1–5.7) are listed by the appropriate level of authority to ensure that proper representation for all procedures and regulations related to this SOP are met.

5.1 Division Leader

The Division Leader's responsibility is to ensure that all activities performed by ERD at the Livermore Site and Site 300 are performed safely and comply with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

5.2 Hydrogeologic Group Leader (HGL)

The HGL's responsibility is to ensure that proper procedures are followed for activities (i.e., drilling, borehole logging and sampling, monitor well installations and development) and to oversee the disposal of all investigation derived wastes.

5.3 Drilling Supervisor (DS)

The DS plans and coordinates all drilling related activities, ensures that all drilling related activities are performed safely and efficiently (using the proper procedures), and that the data generated from these activities are valuable and representative of the true geologic or physical conditions within the borehole. Such activities may include operation of logging equipment, soil sampling, well installation, and development. The DS is also responsible for:

5.3.1 Coordination of the drilling contractor schedules and equipment needs:

- Coordinate the schedules of multiple drill rigs with the drilling contractor.
- Provide the Work Plan to the drilling contractor and answer questions.
- Negotiate the arrival/start date and drill type.
- Monitor the progress of the drilling and anticipate changes in equipment needs (e.g., auger rig, air-mist rig, mud-rotary rig).

5.4 Drilling Coordinator (DC)

5.4.1 The DC provides the interface between the DS and the field activities including:

- Oversight of the Drilling Geologist (DG) and field activities.

- Coordinate the DG's work load.
- Obtain the necessary equipment, supplies, and release numbers from the Technical Release Representative (TRR) for the drilling contractor.
- Provide guidance and training.
- Inform the DG about procedural changes in areas related to drilling (e.g., changes in sampling requests, cuttings disposal issues, new forms, etc.).
- Provide technical input to the DG and Study Area Leader (SAL)/Facility Task Leader (FTL).
- Review borehole and geophysical logs.
- Monitor drilling progress on a daily basis.
- Interact with the Quality Assurance (QA)/Quality Control (QC) officer on drilling and soil sampling issues.
- Estimate the contaminants likely to be present, and the quantity of drilling spoils that may be generated.

5.4.2 During the startup of a new drilling phase, the DS works with the DC and SAL/FTL to:

- Create and finalize all related drilling documents (i.e., the Work Plan and Sampling Plan).
- Work with the SAL/FTL to establish drilling locations, schedules, and budgets for each well.
- Determine the protective equipment necessary for personnel in the field.
- Make well completion decisions and specify the well construction details from the SAL/FTL and Hydrogeologic Group Leader (HGL) input.
- Act as the liaison between the SAL/FTL and the DG.
- Coordinates all necessary biological/archeological surveys prior to drilling. Results of the surveys should be forwarded to the SAL/FTL and Environmental Chemistry and Biological Group Leader (ECBGL).

5.5 Drilling Geologist (DG)

The DG's responsibility is to ensure that drilling activities are carried out according to the specifications designated in the Work Plan, Sampling Plan, Site Safety Plan (SSP), Operation Safety Procedure (OSP), and Standard Operating Procedure (SOP). Additionally, the DG must oversee and document all aspects of the drilling/field investigation, including lithologic and geophysical data, well completion and development specifications, activities of the drillers, sampling and workspace monitoring details. The DG is also responsible for:

5.5.1 Site Preparation and Supply Ordering. The DG must:

- Review the Work Plan prepared by the SAL/FTL and DC, and discuss any questions.

- Assemble all necessary materials, including personal protective equipment (PPE).
- Supply tracking and ordering requests.
- Confirm that all necessary security arrangements have been made to permit site access (e.g., schedule escorts, notify the building coordinator of planned activities, arrange for opening of locked gates).
- Confirm that utility locator and mud pit excavations (if necessary) have been arranged with the field personnel.
- Discuss LLNL site planning requirements and utility lines with field personnel and drillers before drilling begins.

5.5.2 Site Safety

- Supply the SSP, OSP, and SOPs to all workers who enter the drill site.
- Monitor and record work space conditions with appropriate monitoring equipment (including FID, PID, etc.) during drilling activity.
- Confirm that appropriate fencing, warning signs, barricades, animal exit ramps (for mud pit), borehole cover and protection are in place.
- Discontinue work and contact the DC if chemical or physical hazards are encountered.

5.5.3 Field Activities

- Coordinate schedules/actions with field personnel.
- Research site hydrogeology to estimate key parameters (e.g., sample target zones, hydrostratigraphic unit depths and thicknesses, and types of contaminants).
- Obtain a field logbook from the Data Management Group (DMG).
- Calibrate and record calibration information for all monitoring equipment.
- Confirm all sample naming conventions with DMG.
- Collect and document samples.
- Handle all changes and corrections to chain-of-custody (CoC) forms and/or analytical requests.
- Inform the DC, SAL/FTLs, and DMG of any sampling or sampling documentation irregularities.
- Report any deviations from the SSPs, OSPs, or SOPs to the QA/QC Officer.
- If SOPs are violated, a nonconformance report is to be completed and submitted to the QA/QC officer.
- Report missed turnaround times for analytical sample results to QA/QC Officer.
- Confirm that drilling waste analytical results are consistent with the chosen disposal method.
- Decontaminate all sampling equipment.

- Provide frequent updates and documentation of field activities to the DC, HGL, and SAL/FTL.

5.6 Driller

The driller is responsible for the following:

- Must be present during SIMCO drill rig operation.
- Drill rig operation is in compliance with all safety requirements and/or applicable procedures and regulations.
- Direct the Driller's Helper (DH) to ensure that the appropriate procedures are followed.
- Determine if drilling and sampling operations should resume or halt due to safety concerns.

5.7 Driller's Helper (DH)

The DH must follow the driller's directions, ensure all safety requirements and applicable procedures and regulations are met, and inform the driller of any potential unsafe conditions.

5.8 Environmental Chemistry and Biology Group Leader (ECBGL)

The ECBGL's responsibility is to provide biological or chemical information and expertise (i.e., biological surveys, water supplies, chemical field instruments, etc.).

5.9 Field Personnel

The field personnel's responsibilities are to conduct all ERD field work that complies with all established operational and safety procedures, and to inform the HGL when the procedures are inappropriate.

Activities the field personnel are responsible to perform (but are not limited to) are to:

- Collect, store, and ship borehole samples to analytical laboratories.
- Drill, complete wells, log boreholes, and properly develop wells to allow the highest yield and the highest quality samples.
- Communicate the performance of development activities to the HGL and DC to allow for modification of the development methods to improve well yield.

5.10 Site Safety Officer (SSO)

The SSO's responsibility is to ensure the safety of ERD's ongoing operations and facilities and work performed. The SSO's responsibility is to receive the details of potential hazards and procedures for all field activities. The SSO directs this information to the LLNL Hazards Control Department to determine if a new Operational Safety Procedure (OSP) is required, thus assuring that an existing OSP addresses all ES&H issues for each operation.

5.11 Study Area Leaders (SAL)/Facility Task Leader (FTL)

The SAL/FTL are responsible for the overall investigation, planning, assessment, and remediation within a study area.

5.12 Technical Release Representative (TRR)

The TRR is responsible for the acquisition and administration of blanket contract releases for the procurement of goods and services. The TRR has the authority to obligate LLNL for payment of goods and services, delegated by the LLNL Business Manager through the LLNL Procurement Department.

5.13 Treatment Facility Hydrogeologist (TFH)

The TFH is responsible for helping the SAL/FTL determine borehole location and target zone for completion.

6.0 PROCEDURE

Before using the SIMCO drill rig and collecting soil samples, the following site conditions must be considered:

- Limited access due to adjacent buildings or structures, and
- Location of underground and overhead utilities, site slope, soil conditions (i.e., presence of rock, cobblestone, or gravel), and depth of sample.

6.1 Training and Qualifications

The SIMCO drill rig is to be operated by a qualified driller only. Training and qualifications are as follows:

A. Superfund Amendments and Reauthorization Act/Occupational Safety And Health Act (SARA/OSHA) Training: Hazardous Waste Operations and Emergency Response, 40-hour course, Environmental Protection Course No. EP0039, or equivalent training which meets the requirements of 29 CFR 1910.120.

B. Must be enrolled in a hearing conservation program that includes annual training on the effects of noise on hearing.

C. The driller and DH must review this procedure prior to operation and keep for future reference.

D. The driller requires on-the-job training for drill rig operation by the manufacturer's representative, or by apprenticing with a qualified driller. This training will include familiarization with the SIMCO Operators Manual and Parts List for the SIMCO drill rig.

E. The driller must provide the DH with minimal drill rig operational training and to familiarize with the following:

- Drill rig components.
- Operation (i.e., how to shut down the drill rig in an emergency situation).

- Safety precautions.

F. If the driller has not operated the drill rig in over 12 months, a full-day refresher is required to review procedures and testing operations with one other qualified person present.

G. Fulfillment of the training requirements will be documented by the driller and/or DH's signature in the Daily Logbook for the SIMCO Drill Rig Operation (Attachment A).

H. The following is additional recommended training for the drillers and DH:

1. Health Services Course No. OH-0002, Standard First Aid.
2. Health Services Course No. OH-0005, Backcare Workshop.

6.2 Inspection and Maintenance

6.2.1 A visual safety inspection should be performed each day prior to operating the drill rig. Inspect all equipment for safety concerns, including, but not limited to:

A. Damaged components.

B. Excessive corrosion.

C. Hydraulic oil or gasoline leaks.

D. Safety items or equipment (i.e., chain guards).

6.2.2 Escaping hydraulic oil that is under pressure can cause injury to personnel. Therefore, be sure all connections are tight and that the hoses are not damaged. Relieve all hydraulic pressure before starting any adjustment or repair.

6.2.3 The SIMCO Drill Rig Pre-Operational Safety Inspection checklist (Attachment B) should be used as a guide for safety inspections. Any items that are identified as damaged, missing, or inoperative that could affect the safe operation of the drill rig, must be repaired or replaced before further drilling.

6.2.4 The gasoline engine, trailer, and drilling equipment must be maintained to ensure proper operation and condition.

6.2.5 Attachment C lists the required maintenance items and maintenance schedule. Maintenance must be documented in a logbook showing the date and type of maintenance performed.

6.3 Office Preparation

6.3.1 Obtain emergency assistance phone numbers and the location of the nearest telephone. The emergency number is 911.

6.3.2 Assemble all necessary supplies and equipment required by the Sampling and Work Plans.

6.3.3 Review all the appropriate documentation and bring to drilling site. This information may include the Site Safety Plan, OSPs, SOPs, Quality Assurance Proposed Plans (QAPPs), the Sampling Plan (including drawings if necessary), etc.

6.3.4 If the drilling location is not within the LLNL Livermore Site or Site 300 boundaries, ensure that all arrangements have been made in advance (i.e., notification of and approval by appropriate individuals). The property owner is responsible for providing a list of people who should be notified prior to using the SIMCO rig.

6.3.5 If determined by the SAL/FTL and SSO that potentially hazardous conditions (e.g., subsurface contamination) are suspected in an area during drilling operations, the appropriate safety precautions must be taken to keep chemical and radiological exposures to personnel at acceptable levels.

6.4 Field Preparation

6.4.1 Locate underground utilities in the vicinity of the drill site before drilling operations begin.

6.4.2 Trailering

A. Vehicles used to tow the SIMCO drill rig trailer must be appropriately equipped. At a minimum, the vehicle must be a 3/4-ton pickup (or equivalent), be equipped with a Class III trailer hitch, have a compatible electrical trailer connection, and have the appropriate electric brake controller to activate the trailer brakes.

B. Prior to towing the SIMCO drill rig trailer to the drilling site, the driver will examine the tow vehicle and trailer to ensure that the following conditions exist:

1. The trailer hitch is properly latched and secured to the tow vehicle trailer hitch ball. Never grease or lubricate the hitch ball.
2. The safety chains are securely attached to the trailer and the tow vehicle.
3. The drill rig mast, drill bits and augers, and all tools are securely fastened to the trailer.
4. The trailer tires (tread and tire pressure) do not show signs of unsafe conditions.
5. The trailer and tow vehicle brakes, brake lights, turn signals, and tail lights operate properly.

C. When towing the SIMCO drill rig, do not drive over the posted speed limit for vehicles towing trailers. Due to the weight of the trailer, use caution downhill.

6.4.3 Drill Rig Setup

A. Ensure that the sampling location is in accordance with the appropriate sampling plan or other directions provided. If an exact sampling location is specified (instead of a general sampling area), verify the proper location of the sampling operation with the SAL/FTL before commencing setup of the rig.

B. Check for overhead obstructions (i.e., tree limbs or power lines) before raising the drill rig mast. Never operate the drill rig within 10 feet of power lines. Ensure that no obstructions are present that could interfere with the arc made by raising the mast. Also ensure that the fully extended mast length is

allowed for when determining the distance to power lines or other obstructions.

C. Lower all trailer jack legs and level the trailer before raising the drill rig mast. Leave the trailer connected to the towing vehicle, if possible, for added stability.

D. Ensure that the mast pin is installed after the mast is raised.

E. Ensure that the gasoline tank is full and that the engine oil and hydraulic oil levels are full before starting the engine and beginning drilling operations.

F. Set up a 25-ft radius safety perimeter around the drill rig with barricades or other means.

G. Special Safety Considerations:

1. DO NOT attempt to move the drill, even a few feet, with the mast in the vertical position. Always lower the mast to the mast rest for transport.

2. DO NOT operate the drill rig on loose or unstable ground that may shift or settle. Failure to follow this operating restriction could result in the accidental collapse of the drill rig and serious injury to the operators and bystanders.

3. DO NOT operate the drill rig or raise the mast if there is a chance of lightning in the area. Also, use caution when operating the drill rig during high winds or rain.

4. Use extreme caution when lowering the jack legs, since the left rear jack leg of the trailer is located immediately adjacent to the control panel. Also ensure that the other two jack legs are clear before lowering. Severe personal injuries can result from hydraulic-actuated jack legs exerting a crushing force on feet or limbs caught by the machinery.

6.5 Operation

6.5.1 Only a qualified driller is to operate the drill rig.

6.5.2 At the beginning of each day of drilling operations, the driller and DH(s) must sign and date the SIMCO Daily Logbook (Attachment A). Signatures by the operators signify that they are qualified and meet the training requirements, and that the safety inspection has been performed and any problems corrected before starting drilling operations.

6.5.3 The following drill rig operating guidelines were adapted from the SIMCO Operator's Manual and Parts List, and must be followed to minimize equipment damage:

A. Never start the engine without the Hydrostatic Control being in the neutral (zero angle) position or the drill rig may be internally damaged. Start the engine and let it run for a few minutes, especially in cold weather, to warm the hydraulic oil, engine, and engine oil.

B. If a joint will not loosen easily, do not jerk the rotary head. This may result in damage to the drive system.

C. Before drilling, be sure that the off-hole latch is completely closed and is in the locked position. Failure to securely latch the head may cause the head to move during the drilling operation.

D. Never adjust the auxiliary circuit relief pressure above the factory settings or hydraulic or structural components could be damaged.

E. Do not oil, grease, adjust, or perform any maintenance on moving parts when the drill is operating.

6.5.4 The following safety precautions reduce the risk of personnel injury:

A. Never wear anything that may become entangled in the rotating parts (i.e., loose clothing [neckties or scarves], jewelry [bracelets, chains, necklaces], or long hair.

B. Use caution when handling the engine fuel. Never refuel the engine while the engine is hot or is running. Never smoke in the area while filling the fuel tank or servicing the fuel system.

C. Never operate the drill rig engine within a closed building unless the engine exhaust is routed either outside or into an adequate ventilation system.

D. Never stand beneath a suspended load.

E. The winch hook should always be attached to the equipment/drill string components when in use or clipped on a trailer bracket when not in use. If the hook is not secured, be aware of its location so that it does not get caught on anything or cause injury to personnel. Never allow the hook to swing freely in an arc around the drill rig.

F. All personnel not directly involved with the drilling or sampling operations must remain at least 25 ft from the drill rig, or further as required to keep a safe distance from drilling operations such as when assembled drill strings are being raised or lowered. The operating zone around the drill rig should be barricaded, unless work is being performed in a remote location. Barricading is especially important if the drilling location is in an area of heavy pedestrian or vehicle traffic, or if the drill rig will be left unattended while shut down.

G. Hearing protection must be worn by all operators and any observers within 25 ft of the drill rig. Expanding foam earplugs, as supplied by LLNL Stores, are the required form of hearing protection. Contact Hazards Control Industrial Hygiene for acceptable alternative hearing protection.

H. The operators must wear hard hats, safety glasses, and steel-toe shoes. Leather or thick cotton gloves should be worn, unless conditions exist that they would become wet and slippery, or if they would be too cumbersome for activities, such as inserting pins. When drilling into soil that may contain hazardous materials, further precautions must be taken (i.e., wearing protective coveralls, chemical resistant gloves, respirator, or other protective equipment). For operations involving contaminated materials, an OSP must be available or the Hazards Control representative must be contacted for assistance.

I. Personnel must use caution and avoid possible injury when working near the rotating auger.

J. Depress the "Kill" switch located below the control panel to stop the operation at the first sign of any potentially dangerous situation.

K. Use proper methods to lift heavy objects (i.e., auger bits, to reduce the risk of back injury).

L. Do not operate the drill rig after dark unless ample lighting is provided in the area around the drill rig control panel and drill equipment (recommendation: 5 to 10 footcandles).

M. If the drilling or sampling operations indicate the unexpected presence of potentially dangerous materials, stop drilling operations immediately and contact the DS.

6.6 Soil Sampling

6.6.1 Consult SOP 1.2, "Borehole Sampling of Unconsolidated Sediments and Rock."

6.6.2 Split-tube sampler can be driven through gravels or rock, but the SIMCO drill normally cannot drill through rock or gravel/cobble layers greater than 6 ft. The SIMCO drill is too light to have adequate torque and pull-down pressure to drill normally through resistive materials. Therefore, sampling depths and location might have to be adjusted to accommodate soil conditions encountered. If the sampling location is critical, approval from the SAL/FTL or DS may be required before changing sampling location.

6.6.3 The 140-lb. drop weight is used to drive the split-tube sampler into the soil to a required depth to obtain a soil sample. When unable to drive the split-tube sampler at the required depth with the drop weight, 100 blow counts per 6 ft (the number of times the weight is dropped) should be the cut-off point for determining the discontinuation of sampling activities in that location.

6.6.4 Use of the cathead winch for raising the drop weight can be hazardous and must be handled with extreme caution. To avoid being pulled into the winchstand while handling the rope, stand so that your hands are at least 2 to 3 feet from the winch.

6.6.5 Consult SOP 4.3, "Sample Containers and Preservation" for the necessary sample containers and soil volumes required for analysis.

6.7 Field Post Operation

6.7.1 Shutdown and Cleanup

A. When soil sampling has been completed, the drill rig operators are responsible for cleanup, and drilling and sampling equipment decontamination.

B. When sampling and drilling has been completed follow the proper decontamination procedures. See SOP 4.5, "General Equipment Decontamination."

C. All boreholes should be properly backfilled or securely barricaded before personnel leave the area. Refer to the approved sampling plan for specific instructions when drilling in contaminated areas or in aquifers. The sampling plan may require that the hole be backfilled with concrete, cement, or a cement and bentonite mixture (e.g., a drilling operation contacts an aquifer).

D. Follow SOP 1.8, "Disposal of Investigation-Derived Wastes," for the disposal of any unearthed soil.

E. If drilling operations are interrupted but continue in the same location, ensure that all trailer jack legs are secured in the down position and that all equipment is stowed and secured. If the drill rig is left in place for more than one day and not used, the mast must be lowered and secured to the trailer.

F. Before moving the trailer, lower the mast, secure all equipment, and be sure to raise the trailer jack legs completely.

6.8 Office Post Operation

6.8.1 Fill out Chain-of-Custody forms and logbooks according to SOP 4.2, "Sample Control and Documentation."

6.8.2 Handle and ship samples as described in SOP 4.4, "Guide to the Handling, Packaging, and Shipping of Samples."

7.0 QUALITY ASSURANCE RECORDS

7.1 Daily Logbook for the SIMCO Drill Rig

7.2 Inspection and Maintenance Logbook and Records

7.3 Sampling Documentation

7.4 Chain-of-Custody Forms

8.0 ATTACHMENTS

Attachment A—SIMCO Drill Rig Daily Logbook

Attachment B—SIMCO Drill Rig Pre-Operational Safety Inspection

Attachment C—SIMCO Drill Rig Inspection and Maintenance Schedule

Attachment A

SIMCO Drill Rig Daily Logbook

Prior to daily drilling, the driller and DH must sign and date the Daily Logbook (see below). Their signatures signify that they are qualified to operate the SIMCO drill rig, have conducted the safety inspection required by the SIMCO Drill Rig Operation Procedure (Attachment B), and that any unsafe conditions have been corrected before drilling begins.

DATE	DRILLER—Signature	DRILLER'S HELPER—Signature

Attachment B

SIMCO Drill Rig Pre-Operational Safety Inspection

This inspection must be performed by a qualified driller or DH. The checklist shown below is provided as a guide to assist operators in performing safety inspections of the SIMCO drill rig. Any items found to be defective and a possible safety hazard must be corrected before continuing operations with the drill rig.

ITEM	INSPECTION CRITERIA
Drill rig:	
Battery	**Good condition**
Chain guards	**In place**
Engine	**No gasoline or oil leaks**
Engine oil and hydraulic oil	**Levels are full**
Hoses and fittings	**Good condition, no leakage**
Hydraulic components	**Good condition, no leakage**
Mast supports	**No visible damage or excessive corrosion**
Rope (for cathead winch)	**Good condition**
Wire cable (for winch)	**Good condition**
Site conditions:	
Notification of individuals	**Responsible individuals have been notified of drilling activities**
Potential hazards	**Hazards identified and necessary precautions taken to mitigate hazards**
Underground utilities	**Underground utilities located and do not interfere with drilling location**
Trailer:	
Brake lights	**Working**
Tail lights	**Working**
Tires	**Good condition**
Turn signals	**Working**

Attachment C

SIMCO Drill Rig Inspection and Maintenance Schedule

Attachment C—SOP 1.13. SIMCO drill rig inspection and maintenance schedule.

Item	Inspection action	Inspection frequency	Maintenance action
Trailer:			
Brakes	Check operation	Monthly	Repair/replace brake pads or equipment as needed
Lights	Check operation	Monthly	Repair/replace as needed
Structure	Check for corrosion	Monthly	Repair, repaint as needed
Tires	Check for wear, cracking, proper pressure	Monthly	Replace as needed
Drill Rig:			
Wheel bearings	Check for wear	Annually	Repack/replace as needed
Battery	Check condition of terminals and cables	Monthly	Clean terminals, replace cables or battery as needed
Control panel	Verify that levers move smoothly, gauges are operating	Monthly	Repair
Drive chain bearings (6)	N/A	N/A	Lubricate-grease every 40 hr
Feed drive chain (2)	N/A	N/A	Lubricate-oil every 100 hr
Guard panels	Verify that all guard panels are properly installed	Monthly	Repair or replace as needed
Hoses and fittings	Check for cracking, fraying, leaking	Monthly	Repair/replace as needed
Hydraulic oil	Check level, color, odor (rancid)	Daily when operating	Top off as needed (replace every 2,000 hr of operation)
Hydraulic oil filters	Check for leakage	Monthly	Replace annually or after 300 hr or operation, or after failure of major component
Hydraulic pumps, cylinders, etc.	Check for leakage	Monthly	Repair as needed
Main winch—shaft bearings	N/A	N/A	Lubricate-oil every 40 hr
Main winch—worm gear housing	N/A	N/A	Lubricate-oil every 500 hr
Mast pivot (2)	N/A	N/A	Lubricate-grease every 100 hr
Mast slides	N/A	N/A	Lubricate-grease every 8 hr
Rope	Check for fraying, loose fittings	Monthly	Replace as needed
Rotary head	N/A	N/A	Lubricate-grease every 100 hr
Steel (mast, supports, etc.)	Check for corrosion	Monthly	Repair, repaint
Thrust assembly	N/A	N/A	Lubricate-grease every 40 hr
Vertical feed chains	N/A	N/A	Lubricate-oil every 100 hr
Wire cable	Check for fraying, loose fittings, kinks, smashed or damaged sections	Daily	Replace as needed
Wiring	Check for loose connections, broken or loose wires	Monthly	Repair, replace